

Using Research-to-Operations Evaluation Results to Shape a National Weather Service Training Experience



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2017 NOAA Testbed and Proving Ground Workshop

Primary Goal:

Using Himawari-8 imagery and a phenomena-based approach, gain insight into which spectral bands, channel differences, and/or RGBs offer the most operational value in the opinions of participating forecasters.

Participants:

9 NWS Forecasters – Journey (5), Lead (3), and SOO (1)

Eastern Region: 2 (CLE, OKX)

Central Region: 2 (DVN, FGF)

Western Region: 2 (MFR, TFX)

Southern Region: 2 (ABQ, MLB)

Alaska Region: 1 (AAWU)

NASA SPoRT RGB SMEs:

Andrew Molthan

Emily Berndt

Kevin Fuell



From the perspective of operational analysis and forecasting needs, rank **imagery** from the 15 spectral bands used this week in order of importance to you; with 1 being the most important and 15 being the least important.

	Cumulative (Overall) Rank
Band 3 0.64 μm (Red; 0.5 km):	10 (1)
Band 13 10.4 μm (Clean IR Longwave):	25 (2)
Band 9 6.9 μm (Mid-Level Water Vapor):	33 (3)
Band 10 7.3 μm (Low-Level Water Vapor):	40 (4)
Band 7 3.9 μm (Shortwave Window):	47 (5)
Band 8 6.2 μm (Upper-Level Water Vapor):	51 (6)
Band 4 0.86 μm (Veggie; 1 km):	56 (7)
Band 14 11.2 μm (IR Longwave):	71 (8)
Band 5 1.6 μm (Snow/Ice):	76 (9)
Band 1 0.47 μm (Blue; 1 km):	79 (10)
Band 6 2.3 μm (Cloud Particle Size):	83 (11)
Band 11 8.6 μm (Cloud Top Phase):	87 (12)
Band 15 12.4 μm (Dirty IR Longwave):	88 (13)
Band 12 9.6 μm (Ozone):	96 (14)
Band 16 13.3 μm (CO2):	108 (15)

Finding 1: While some spectral band imagery available on GOES-R will have numerous applications, others, if at all, will only be valuable for analyzing certain atmospheric phenomena.

Finding 2: The complexity of some RGB composite imagery (e.g., Air Mass and Nighttime Microphysics) will require in-depth training and operationally-relevant examples that are devoted to assisting NWS forecasters in understanding and applying the RGBs for decision making.

The full evaluation report and complete list of findings and recommendations is available online at the Operations Proving Ground website.

Purpose: To provide NWS SOOs and DOHs with an enhanced understanding of operationally-significant GOES-R/S fundamentals.

Days 1 and 2 - Main Classroom

Lecture and Interactive Labs

- Advanced Baseline Imager
- Satellite Information Familiarization Tool
- Geostationary Lightning Mapper
- Spectral Band Weighting Functions
- Identifying Water Vapor Features
- Red-Green-Blue (RGB) Composites



Day 3 - Concurrent Sessions (2 h each)

1. Main Classroom (various topics)
2. Weather Event Simulator
3. Multispectral Approach to Enhance IDSS (OPG)

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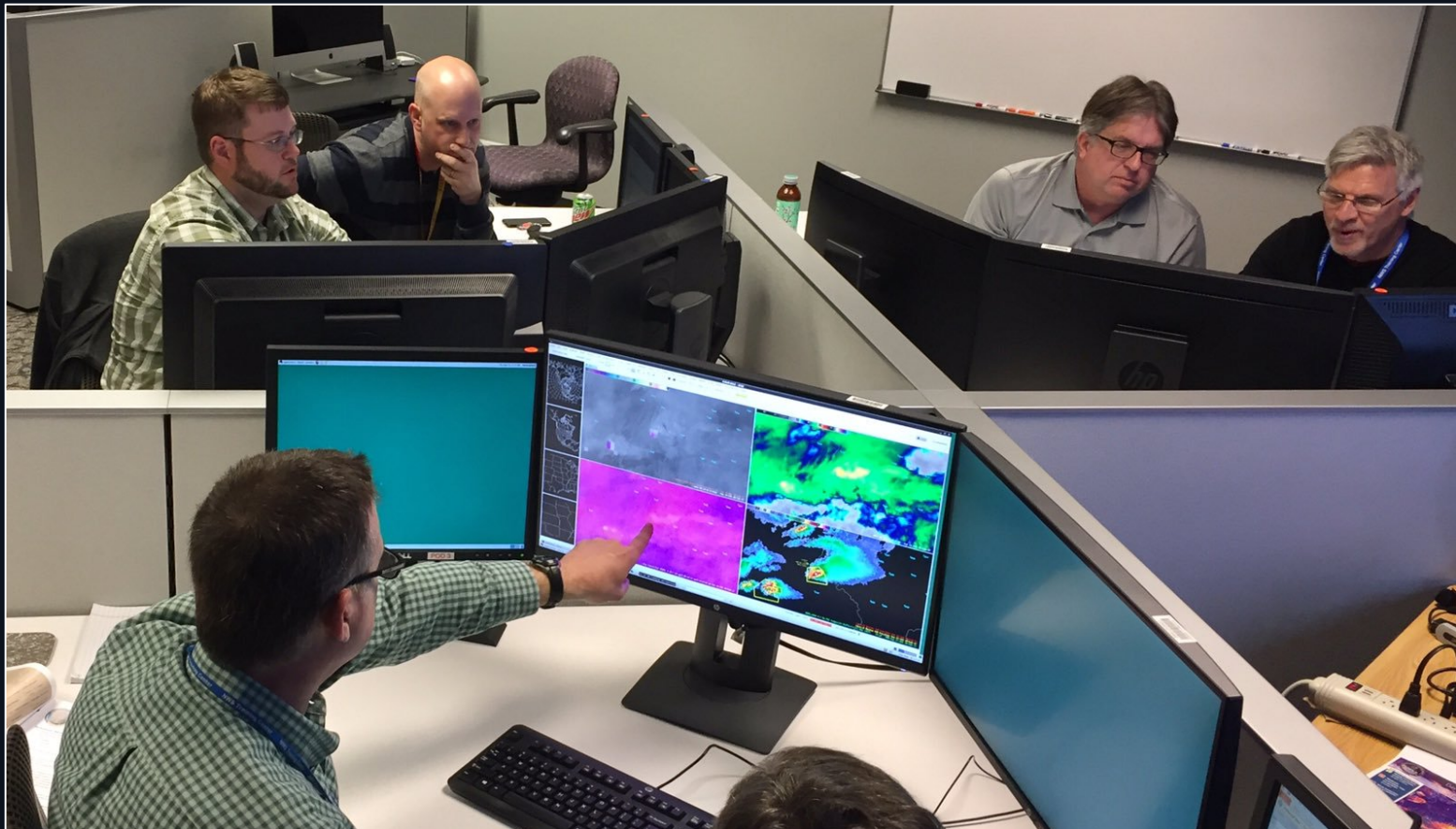
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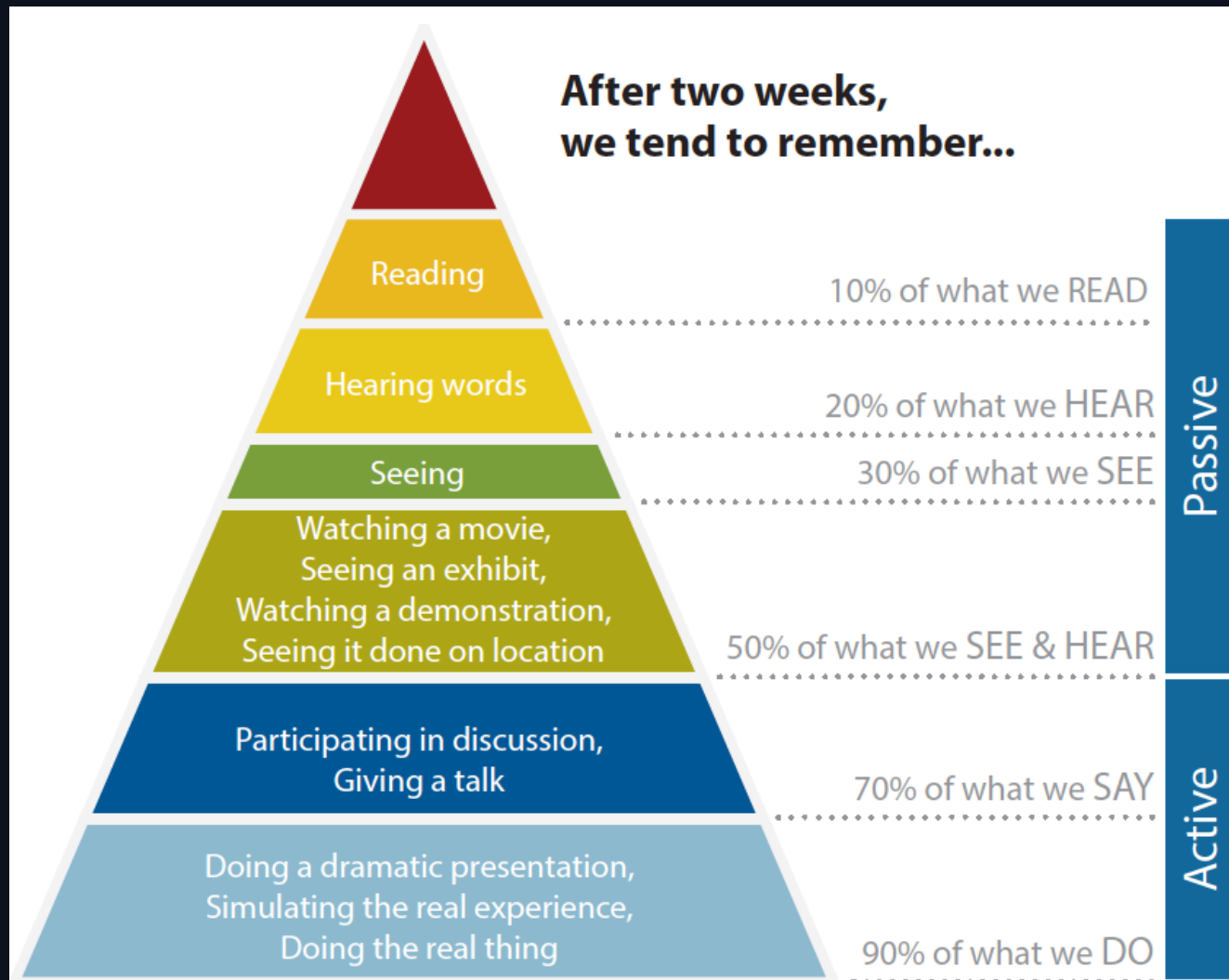
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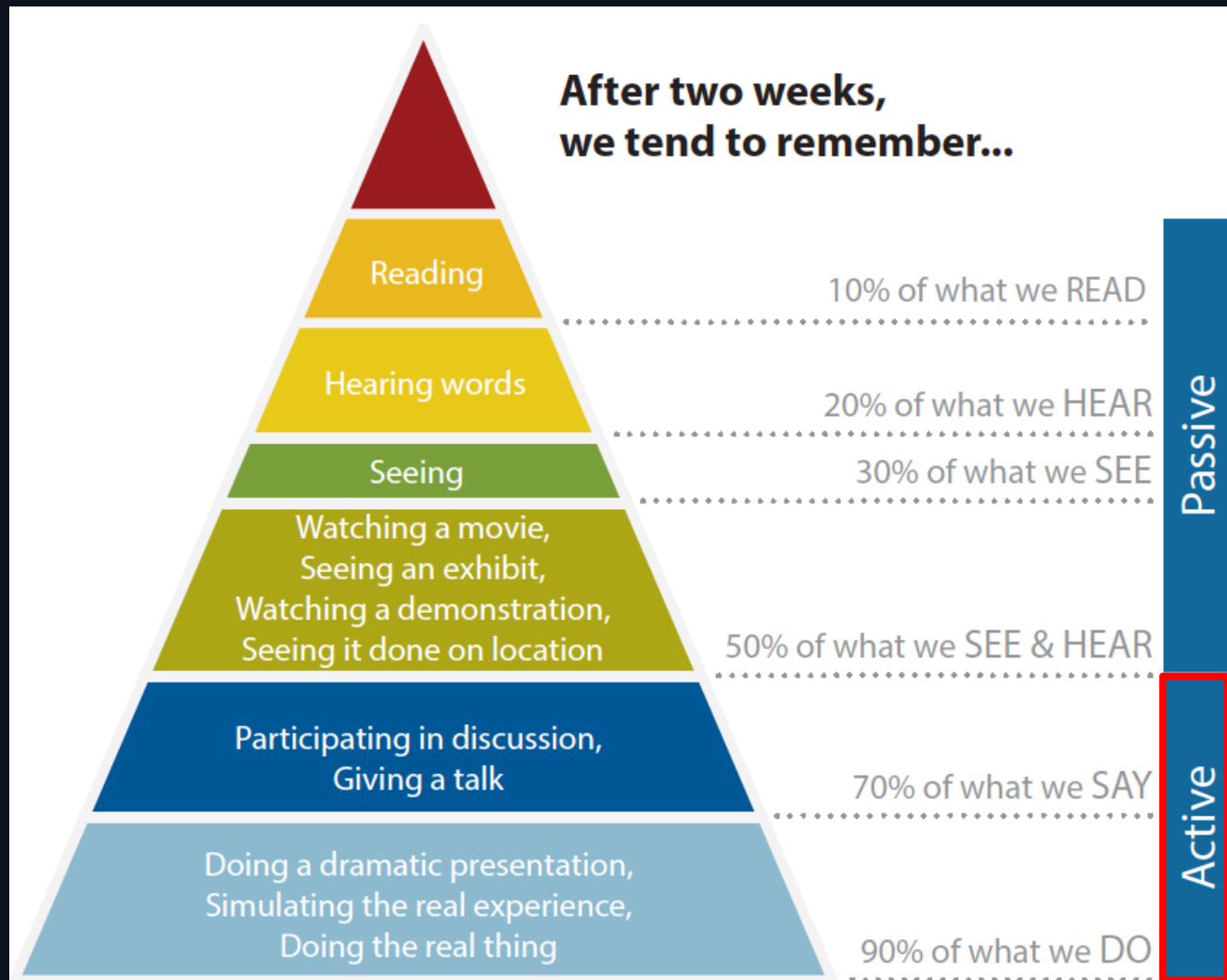


The key to creating a successful adult learning experience is "interactivity that engages the learner's mind to do those things that improve ability and readiness to perform effectively."

***Michael Allen,
Expert in Learning Research and Instructional Design***



(Based on the research of Edgar Dale, originator of "The Cone of Learning.")



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Problem-centered

Immediate Relevance

Critical Reflection with Learners

Vary the Practice

Assess Learning

Problem-centered - *Phenomena-based Analysis/Interpretation in Teams*

Immediate Relevance - *Usefulness of GOES-R Imagery in AWIPS*

Critical Reflection with Learners - *Focused Discussion Questions*

Vary the Practice - *Similar Approach, Different Phenomena*

Assess Learning - *Post-Session Interaction*

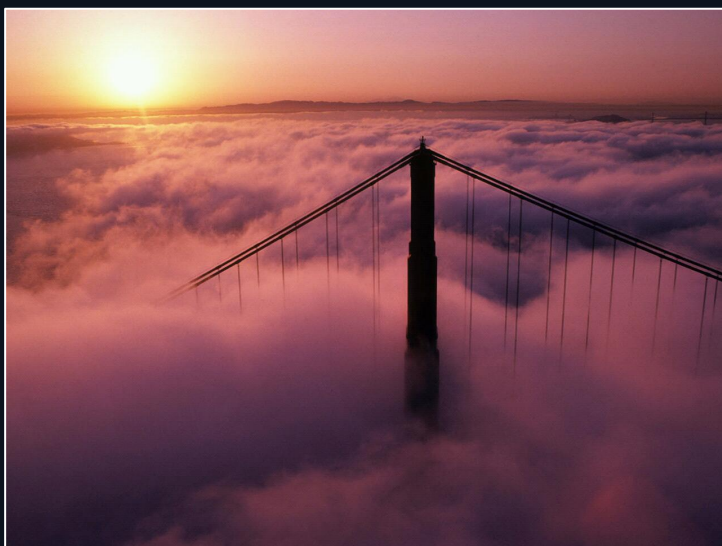
Convection



Wildfires



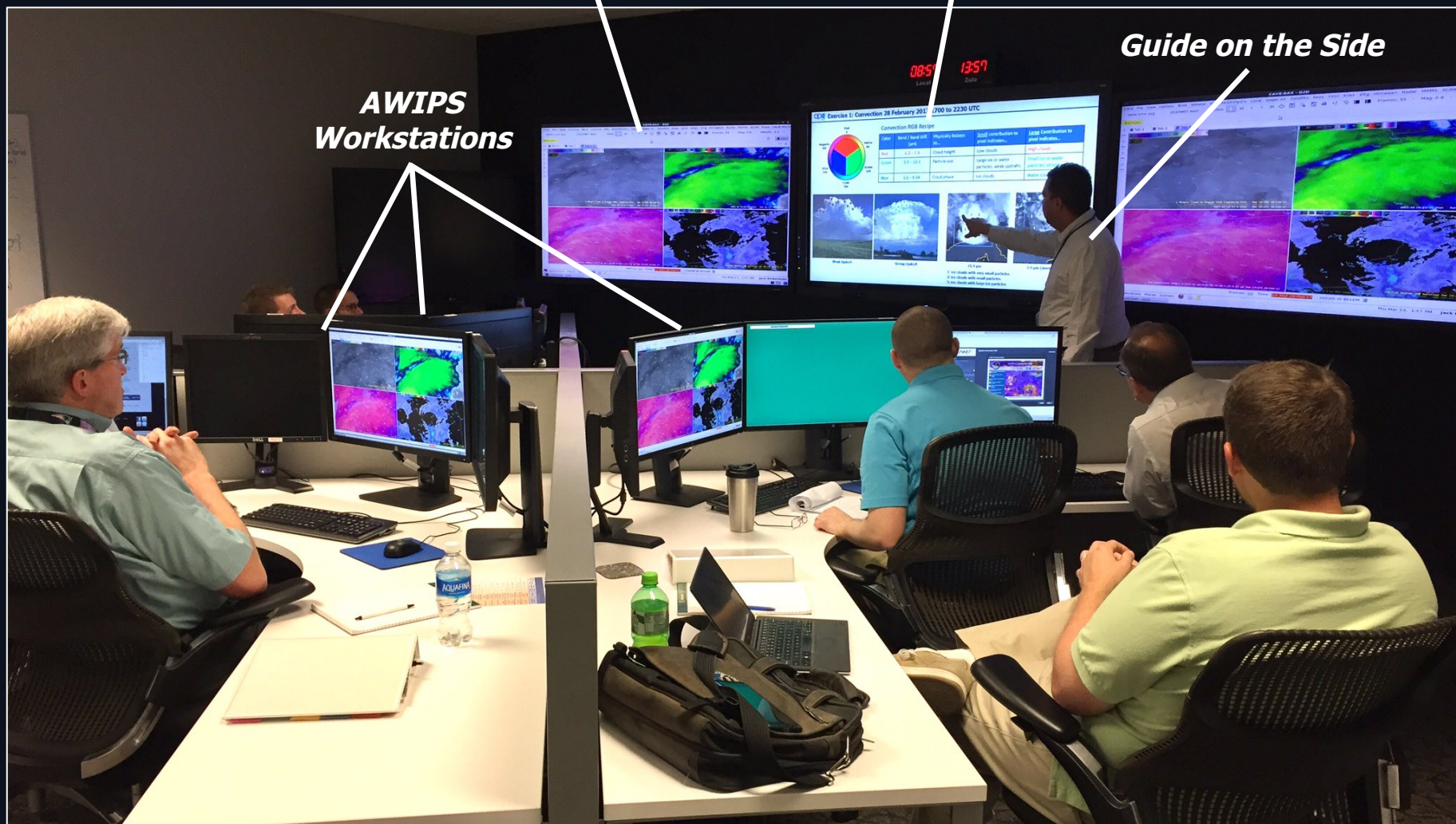
Fog and Low Stratus

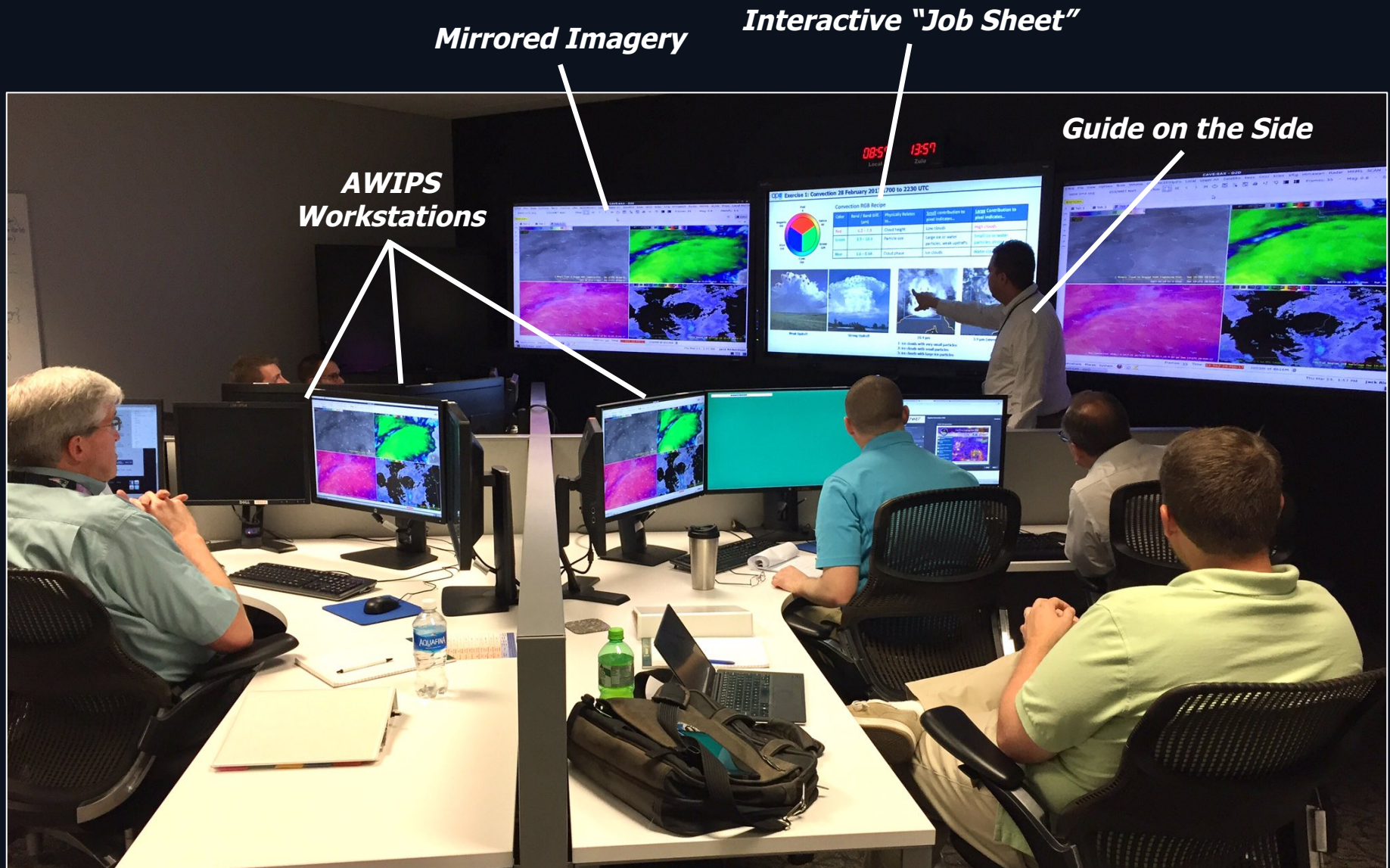


Classes 1-5: Himawari-8 Imagery
Classes 6 and 7: GOES-16 Imagery

**Small team phenomena-based
analysis of spectral bands and RGB
composites**

**Instructor led exercises were
designed to **highlight results** from the
OPG Multiple Spectral Band evaluation**





Content supports the learning process; systematically delivered to assist the learners while they solve problems.

Interactive “Job Sheet” with Focused Analysis Display and Discussion Questions

Exercise 1: Convection 28 February 2017 1700 to 2230 UTC

Tab 2 (10 minutes)...

Top Left: 0.64 μm (Red Visible), NLDN, and Earth Networks Total Lightning

Top Right: 10.4 μm (Clean IR Longwave)

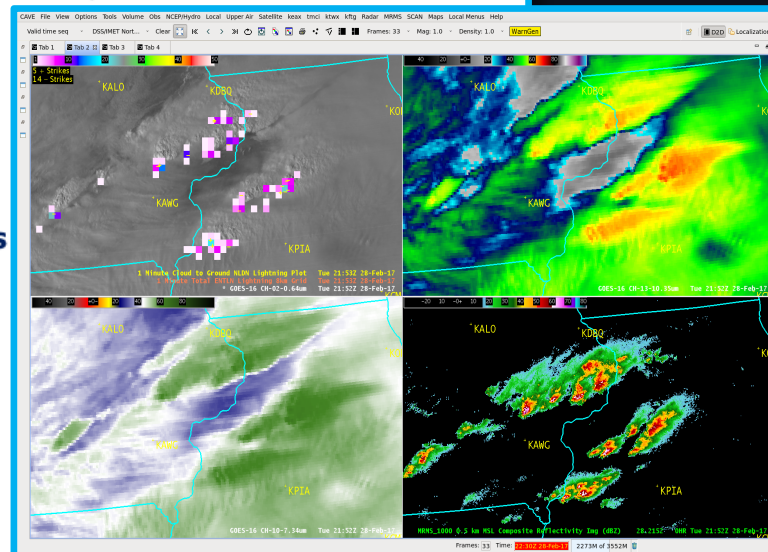
Bottom Left: 7.3 μm (Low-level WV)

Bottom Right: MRMS 0.5° MSL Reflectivity and Convective Warnings

Questions...

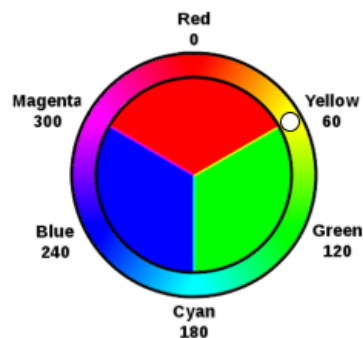
What unique features can you identify at these spatial resolutions?

What differences can you identify between the areas of convection across Iowa to those across Illinois?



Introducing New Concepts

Exercise 1: Convection 28 February 2017 1700 to 2230 UTC



Convection RGB Recipe

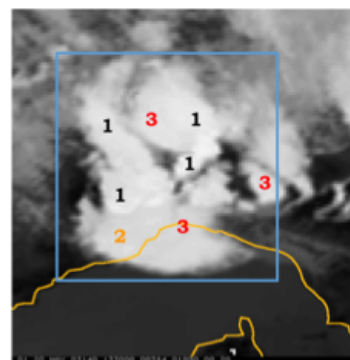
Color	Band / Band Diff. (μm)	Physically Relates to...	<u>Small</u> contribution to pixel indicates...	<u>Large</u> Contribution to pixel indicates...
Red	6.2 – 7.3	Cloud height	Low clouds	High clouds
Green	3.9 – 10.4	Particle size	Large ice or water particles, weak updrafts	Small ice or water particles, strong updrafts
Blue	1.6 – 0.64	Cloud phase	Ice clouds	Water clouds



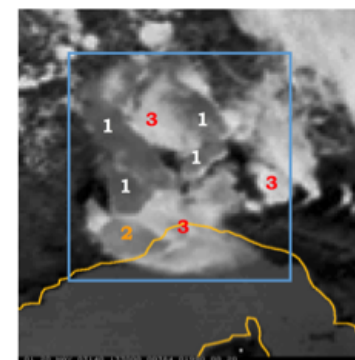
Weak Updraft



Strong Updraft



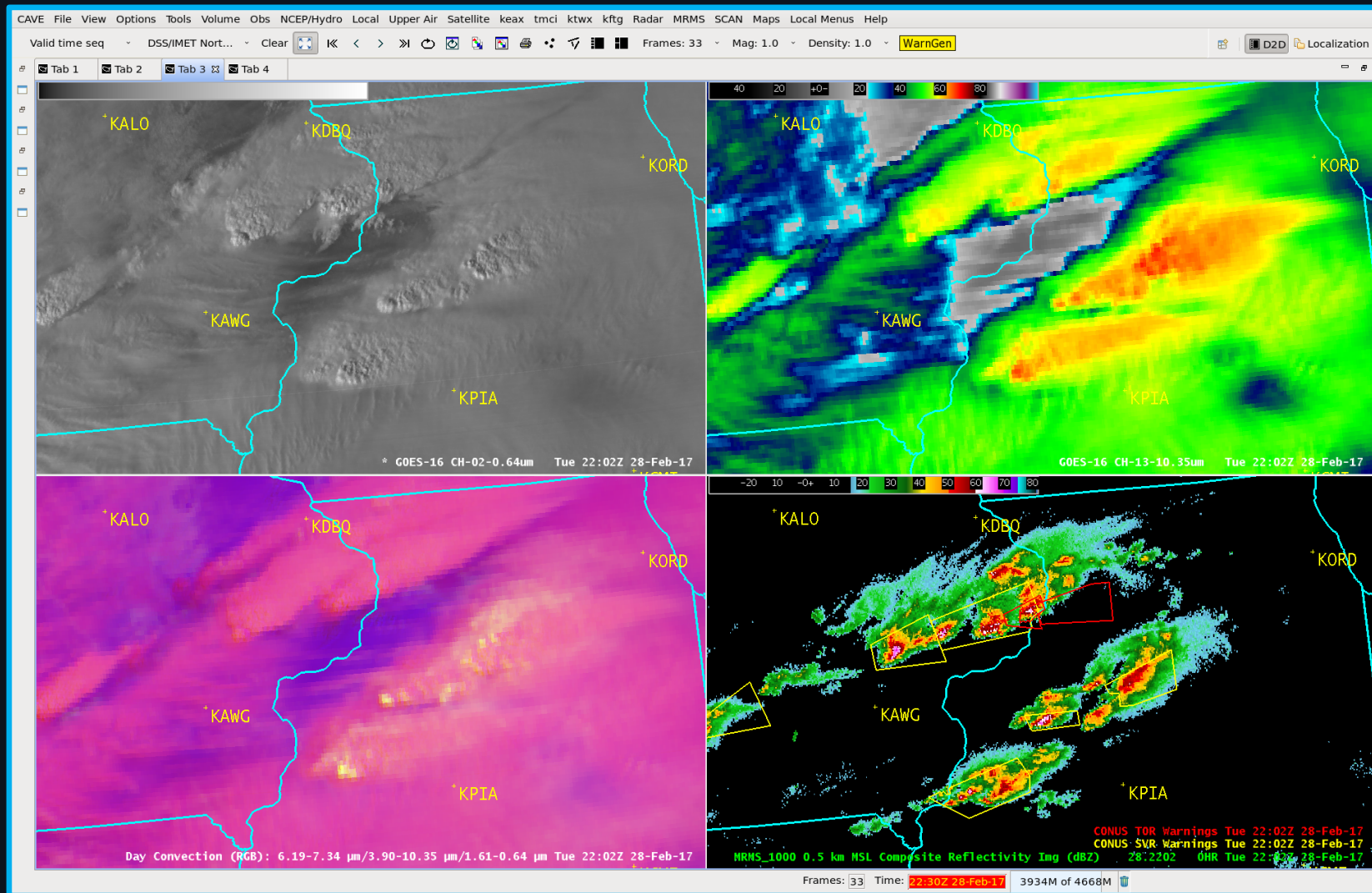
10.4 μm



3.9 μm (inverse curve)

- 1: ice clouds with very small particles
- 2: ice clouds with small particles
- 3: ice clouds with large ice particles

Self Discovery with New Concepts



Does the Day Convection RGB composite provide any information that increases your situational intelligence about developing convection?

"By far, the OPG session was the best session of the day. In fact, I'd argue that this made the entire trip worthwhile. I could've spent all day in the OPG. I think the biggest thing with the OPG session was that they, first and foremost, presented RELEVANT case studies and led the students through the exercises."

"The OPG session was excellent. It was quick, well constructed, and had a great mix of exploring and instructor led training."

"The OPG demonstration was the best and most beneficial session of the 3-day course. The explanations of each band and seeing it in the various scenarios was exciting for the SOO/DOHs present."

***"How can we provide this experience to forecasters
at our forecast office?"***

- numerous S00s

Brainstorming with Kim Runk, Matt Foster, and Greg Mann (SOO@DTX)

Imagine the following...

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The SME introduces a concept, directs the forecasters to interrogate the same data using the same procedures, and then the group discusses observations.

Rinse, Repeat

NOAA Testbed and Proving Ground evaluation results can and should impact NWS forecaster training content and delivery, when appropriate.

Adult professionals learn best when actively engaged in expending effort to solve job-relevant problems.

OPG concept provides NWS forecasters the opportunity to actively explore Big Data remotely to make unique observations, discoveries, and learn; more powerful than a passive GoToMeeting webinar.

OPG will demonstrate the ThinClient remote data connection capability Thursday during the GOES-16 First Results Workshop at 10:30 CDT.

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